



HELICOPTERS, INC.

GULF COAST DIVISION
LAKE CHARLES, LOUISIANA

PROCESS SPECIFICATION

PROCESS SPECIFICATION NUMBER: ERA-1002

412 Auxiliary Fuel Tanks

CLOSURE PROCEDURE FOR THE SHELL ASSEMBLY

PREPARED BY:

John E. Stanley
MESH PLASTICS LTD.

DATE: 1/23/87

APPROVALS

MANUFACTURING	QUALITY CONTROL	ENGINEERING	
			MESH
			ERA

PROCESS SPECIFICATION

Scope: This specification outlines the requirements for the closure procedure for the shell assembly for the 412 Auxiliary Fuel Tanks.

Conformation: This specification does not conform to any existing government specification.

Subcontractors: MESH PLASTICS, LTD. of Lake Charles, Louisiana, or its subcontractor shall be the only subcontractors qualified to construct the FRP requirements and shall comply with this process specification. Any deviations or variations are to be submitted to ERA for approval with proper documentation prior to fabrication.

Conflicts: In the event of a conflict with engineering drawing(s) and this specification, the drawing(s) shall govern.

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**Closure procedure for the Shell Assembly
for the 412 Auxiliary Fuel Tanks**

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Rev	Date	Pages	Approvals					
			Manufacturing		Quality Control		Engineering	
			MESH	ERA	MESH	ERA	MESH	ERA
IR	1/23/87	ALL	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>
A	2/12/87	5,6 (REISSUE)	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>

ERA PS 1002REV ADATE 2/16/87MATERIALS

<u>MATERIAL</u>	<u>NAME</u>	<u>MANUFACTURER</u>
Resin	Derakane 470-36	Dow Chemical Midland, MI
Promoter	Cobalt Napthenate	AKZO Chemie New Brunswick, NJ
Accelerator	Dimethylaniline	Buffalo Colors West Paterson, NJ
MEKP Catalyst	Hi Point 90	Witco Chemical Richmond, CA
	Lupersol DHD 9	Lucidol Chemical Buffalo, NY
UV Inhibitor	UV-9	Industrial Chemicals Atlanta, GA

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DATE 6/26/95	ENGINEERING ORDER		E.O. No. B-1	SHT. 1 OF 1
BY T. Harville	TITLE PROCESS SPECIFICATION		DWG. AFFECTED 1002	
APPROVED BY <i>T. Schwart</i>			ENTERED ON COMPUTER BY: DATE:	
REASON FOR CHANGE: ADD ALT P/N FOR 3/4 & 1 1/2 oz TYPE "E" GLASS MAT (M127)				
<p>3/4 oz TYPE "E" GLASS MAT. M113-3/4 oz CERTAINTeed OR M127-3/4 oz CERTAINTeed WICHITA FALLS, TX.</p> <p>1 1/2 oz TYPE "E" GLASS MAT. M113-1 1/2 oz CERTAINTeed OR M127-1 1/2 oz CERTAINTeed WICHITA FALLS, TX.</p>				

MATERIALS

<u>MATERIAL</u>	<u>NAME</u>	<u>MANUFACTURER</u>
Putty filler (Amorphous Fumed Silica)	Aerosil	Dequssa Corp. Teterboro, NJ
	Cabosil	Cabot Corp. Boston, MA
Milled Fibers	731 ED	Owens-Corning Anderson, S.C.
1-1/2 oz Type 'E' glass mat	Compatamat - 1-1/2 oz.	PPG Industries Shelby, NC
	M113 - 1-1/2 oz.	Certainteed Wichita Falls, TX
10 mil 'C' glass, or	Modiglass	Reichold Chemical Bremen, OH
	Manville Glass	Manville Corp. Denver, CO
10 mil 'A' glass veil	Surglass	Superior Glass Bremen, OH

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REV A

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MATERIALS

<u>MATERIAL</u>	<u>NAME</u>	<u>MANUFACTURER</u>
Paraffinated Styrene	TF-100	Industrial Chemicals Atlanta, GA
Grinding Discs	36 Grit Type D 60 Grit Type C 60 Grit Type C	3M Corp. St. Paul, MN

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Laminate Manufacture

- 1) Sand mold side of parts # 41228-202-029-001/003 (left side) or 41228-202-029-002/004 (right side) using 40 grit disc on a D.A. sander.
- 2) Check for proper fit and secure to baffles #1 and #2 the closure tie - in brackets using a minimal amount of putty. Allow to cure until putty hardens.
- 3) On the flat surface make a "hot patch" type layup by using 3 layers of 4" wide 1-1/2 oz type E glass mat. Saturate each layer with 470-36 resin containing UV inhibitor (no pigment). Deaerate with serrated rollers.
- 4) Apply "hot patch" type layup over putty extending 2" onto the baffle. Saturate each layer with 470-36 resin containing UV inhibitor (no pigment). Deaerate with serrated rollers.
- 5) Apply one layer of 10 mil veil over wet mat making sure all mat fibers are covered. Saturate with 470-36 resin containing UV inhibitor (no pigment). Deaerate with serrated rollers. Allow to cure.
- 6) Dress down any areas of roughness and apply a hot wax coat of 470-36 resin containing UV inhibitor and paraffinated styrene solution. Allow to cure until tack free.
- 7) Cut closure as shown on Shell Assembly Dwg. 41228-201-001/002.
- 8) Fit piece #41228-202-002-001/002 in opening on piece #41228-202-001-001/002 and check to see that a gap of 0.06" to 0.12" is obtained between the two pieces. Separate the two pieces and seal the exposed edges as follows.
- 9) Apply one layer of 10 mil veil to all cut edges. Saturate with Derakane 470-36 resin containing UV inhibitor (NO pigment). Deaerate with serrated rollers. Allow to cure.
- 10) Apply "hot" coat of Derakane 470-36 resin containing UV inhibitor (NO pigment). Allow to cure.
- 11) Apply "Hot Wax" coat of Derakane 470-36 resin containing paraffinated styrene & UV inhibitor (NO pigment). Allow to dry tack free.
- 12) Lightly sand wax surface to allow bonding using 80 grit sand paper.
- 13) Grind recessed areas on pieces # 41228-202-002-001/002 & 41228-202-001-001/002 where bonding will occur using 36 grit grinding discs.

LAMINATE MANUFACTURE

- 14) Using a vacuum, clean the inside of the tank shell after all parts have been installed, excluding the shell closure piece.
- 15) Wipe the entire interior surface out carefully with a tack rag. Pull the tack rag through the forward stiffeners with a wire or string.
- 16) Wipe the inner surface of the closure piece with a tack rag. Blank off all openings in the shell and closure.
- 17) Fit pieces together using temporary closure clips. Fill gaps between clips with putty. Allow to cure.
- 18) Remove all temporary closure clips by pushing them into tank & removing through access openings.
- 19) Fill areas where clips were located with putty. Allow to cure.
- 20) Smooth any rough areas with 36 grit grinding discs.

NOTE: LAYUP ON CLOSURE AT BAFFLES IS AS SHOWN ON SHELL ASSEMBLY
DWG. 41228-201-001/002.

- 21) Apply 1" wide strip of 10 mil veil over putty joint. Saturate with Derakane 470-36 containing UV inhibitor (NO pigment). Deaerate with serrated rollers.
- 22) Apply 2" wide strip of 1-1/2 oz type E glass mat. Saturate with Derakane 470-36 containing UV inhibitor (NO pigment). Deaerate with serrated rollers.
- 23) Apply 3" wide strip of 1-1/2 oz type E glass mat. Saturate with Derakane 470-36 containing UV inhibitor (NO pigment). Deaerate with serrated rollers.
- 24) Apply 4" wide strip of 1-1/2 oz type E glass mat. Saturate with Derakane 470-36 containing UV inhibitor and pigment. Deaerate with serrated rollers.
- 25) Repeat step 14 three additional times. Allow to cure.
- 26) Sand lay-up to contour of tank using 36 grit grinding discs.
- 27) Inspect for any low spots in lay-up.

INSPECTION

It is the purpose of the inspection to verify that each part has been fabricated in accordance with and meets the requirements of this specification.

RESPONSIBILITIES: It is the responsibility of the fabricator to make available to ERA Helicopter or his authorized representative any or all of the following:

Records: Records pertaining to the part(s) being purchased shall be supplied when requested. These may include:

- Materials specifications
- Equipment drawings or mold jig
- Materials test results.
- Dimensional verification reports.
- Rework and repair reports.

MATERIALS:

Raw materials used for laminates shall be virgin materials and shall be free of contaminants as described on pgs. 11, 12, 13, and 14.

FABRICATED PARTS: The part to be inspected shall be properly located and positioned, and shall be in condition to permit safe and thorough inspection. Reasonable means shall be provided to permit the inspector to visually examine the entire inner and outer surfaces of the part.

Allowable defects are listed on pgs. 9 and 10.

The following inspection tools and equipment shall be made available for use by the inspector.

- Barcol hardness tester.
- Acetone squeeze bottle with acetone.
- Extension cord with ground fault switch.
- A vapor tight inspection light.
- Thickness gauge.

INSPECTION

TEST OF FINISHED
PARTS:

The following basic tests shall be included as a minimum in the Acceptance Inspection.

Barcol Hardness Test - A test of resin cure shall be made in accordance with ASTM D2583. Take 10 readings, discard highest and lowest, average the remaining readings. Minimum acceptable average reading is 30.

Surface Cure Test - An acetone test shall be used to detect surface inhibition on surfaces exposed to air during cure. The procedure that shall be used is the following: rub a few drops of acetone on the surface and check for tackiness after the acetone has evaporated. Persistent tackiness indicates incomplete cure.

Dimensions - The inspector shall be provided with copies of all approved drawings or mold jigs.

OTHER APPLICABLE DOCUMENTS:

ASTM Standards

C 581-74-Test Method for Chemical Resistance of Thermosetting Resins Used in Glass Fiber Reinforced Structures.

D 638-77a-Test method for Tensile Properties of Plastics.

D 790-71-Test Methods for Flexural Properties of Plastics and Electrical Insulating Materials.

D 883-78a-Definitions of Terms Relating to Plastics.

D 2583-75-Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.

ALLOWABLE DEFECTS

Defect	Surface inspected
Cracks(through part)	None
Crazing (fine surface cracks)	Max dimension 1/2 in., max density 5 per sq. ft. min 2 in apart
Blisters(rounded elevations of the laminate surface over bubbles)	Max 1/4 in., dia x 1/8 in. high, max 1 per sq ft, min 2 in apart
Wrinkles and solid blisters	Max deviation, 20% of wall thickness but not exceeding 1/8 in.
Pits(craters in the laminate surface)	Max dimensions, 1/8 in dia x 1/16 in deep, max density 10 per sq. ft.
Surface porosity(pin-holes or pores in the laminate)	Max dimensions, 1/16 in dia. x 1/16 in deep, max density 10 per sq. ft.
Chips	Max dimension of break, 1/4 in, and thickness no. greater than 20 percent of wall thickness, max density 1 per sq ft
Dry spot(nonwetted reinforcing)	Max dimension, 2 sq in. per sq ft
Entrapped air (bubbles or voids in the laminate)	1/8 in. max dia, 4 per sq in. max density; 1/16 in. max dia. 10 per sq in. max density

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ALLOWABLE DEFECTS

<u>Defect</u>	<u>Surface inspected</u>
Exposed Glass	None
Burned Areas	None
Exposure of cut edges	None
Scratches	Max length 1 in. max depth 0.010 in.
Foreign Matter	1/16 in.dia. max density 1 per sq ft

FIBERGLASS SURFACING MAT

1.0 Scope

1.1 The scope of these procedures is to describe the visual, physical and mechanical parameters which characterize fiberglass surfacing mat used by the fabricator.

2.0 Definitions

2.1 Fiberglass Surfacing Mat - A random arrangement of glass fibers bonded with a binder to form a thin porous mat which is supplied in roll form. Surfacing mat is usually used to reinforce the corrosion resistant resin rich liner on the inside of equipment and to provide a smooth surface on the exterior of equipment.

2.2 Binder - Chemical treatment applied to the jackstraw arrangement of glass fibers to give the mat integrity. Specific binders are utilized to promote chemical compatibility with the various laminating resins used.

2.3 Slugs - Unfiberized beads of glass.

3.0 Requirements

3.1 Visual Requirements - Each roll of fiberglass surfacing mat shall be inspected to insure it is consistent in color, texture and appearance. Any holes, cuts or visual irregularities shall be removed from the mat prior to or during fabrication.

3.1.1 Slugs - Mat which contains more than four slugs per 100 lineal feet is rejectable.

3.1.2 Wrinkles - Crosswise wrinkles or waves that are visible at a 45 deg. angle and lengthwise wrinkles that can be readily flattened under pressure and that do not crease or change the dimensions of the mat are acceptable.

3.1.3 Wet Spots and Bar Marks - The mat shall be free from these defects.

3.1.4 Delamination - The mat shall not delaminate, i.e. shall not separate into layers in coming off the roll.

FIBERGLASS SURFACING MAT

3.2 Physical Properties

3.2.1 Thickness - The thickness of the mat in each roll shall be measured.

3.3 Packaging Requirement - Packaging shall be visually inspected to assure proper labeling and that the package is free from damage that may render the mat unusable.

3.3.1 The mat shall be packaged in an unbroken carton as shipped from the mat manufacturer's factory. The mat used shall not be repackaged in the distribution of the mat after the manufacturer has shipped the mat.

3.4 Documentation - It is the responsibility of the fabricator to maintain records showing the results of all material testing. This information shall show at a minimum, the following:

- (a) Form of material
- (b) Manufacturer
- (c) Manufacturer's product description including binder type (treatment)
- (d) Manufacturer's product code
- (e) Production date, if available, or production code on carton.
- (f) Property measured and value recorded

- * Visual inspection
- * Width
- * Thickness
- * Packaging

- (g) Job number (Internal Fabricator Control Number)
- (h) Fabricated part identification number

FIBERGLASS CHOPPED STRAND MAT

1.0 Scope

1.1 The scope of these procedures is to describe the visual, physical and mechanical parameters which characterize fiberglass chopped strand mat used by the fabricator.

2.0 Definitions

2.1 Chopped Strand Mat - Chopped strand mat is made from randomly oriented glass strands which are held together in mat form using a binder. Each strand contains a sizing.

3.0 Requirements

3.1 Visual Requirements - Each roll of chopped strand mat shall be inspected to insure it is consistent in color, texture and appearance. It shall be free from surface irregularities, fluffy masses, dirt spots or other foreign material; water spots, knots, binder spots larger than 2" in diameter, clumps of strands and tears or holes which may result from removal of defects.

3.2 Physical Requirements

3.2.1 Weight - The square foot weight of the mat shall be measured for each carton of mat used. All specimens shall fall within the range specified for the product.

3.3 Packaging Requirement - Packaging shall be visually inspected to assure proper labeling and that the package is free from damage that may render the mat unusable.

3.3.1 The mat shall be packaged in an unbroken carton as shipped from the mat manufacturer's factory. The mat used shall not be repackaged in the distribution of the mat after the manufacturer has shipped the mat.

FIBERGLASS CHOPPED STRAND MAT

3.4 Documentation - It is the responsibility of the fabricator to maintain records showing the results of all material testing. This information shall show at a minimum, the following:

- (a) Form of material
- (b) Manufacturer
- (c) Manufacturer's product description including binder type (treatment)
- (d) Manufacturer's product code
- (e) Production date, if available, or production code on carton.
- (f) Property measured and value recorded

- * Visual inspection
- * Width
- * Thickness
- * Packaging

- (g) Job number (Internal Fabricator Control Number)
- (h) Fabricated part identification number